

WHAT IS CLAIMED IS:

- 1 1. A high-density plasma process for depositing a layer of Silicon Nitride on a
2 substrate in a plasma reactor, the process including the steps of:
3 providing a gas including precursor components of the Silicon Nitride,
4 generating a plasma applying a radio-frequency power to the gas, and
5 the plasma reacting with the substrate to deposit the layer of Silicon Nitride,
6 characterized in that
7 the power applied to the gas is in the range from 2.5kW to 4kW.
- 1 2. The process according to claim 1, wherein the power applied to the gas is
2 in the range from 2.9kW to 3.2kW.
- 1 3. The process according to claim 1, wherein the step of generating the
2 plasma includes:
3 applying a first radio-frequency power to the gas by means of a first power
4 source, and
5 applying a second radio-frequency power to the gas by means of a second
6 power source, a ratio between the first power and the second power being in the
7 range from 2.1 to 2.5.
- 1 4. The process according to claim 3, wherein the ratio between the first power
2 and the second power is in the range from 2.2 to 2.4.
- 1 5. The process according to claim 1, wherein the step of providing the gas
2 includes providing each precursor component at a flow rate in the range from 80% to
3 95% of a corresponding rated value supported by the reactor.
- 1 6. The process according to claim 1, further including the step of cooling the
2 substrate during the deposition of the layer of Silicon Nitride.
- 1 7. The process according to claim 1, further including the steps before the
2 deposition of the layer of Silicon Nitride of:
3 providing a further gas including Oxygen,
4 generating a further plasma from the further gas, and
5 heating up the substrate by means of the further plasma, thereby generating a
6 first oxide liner on the substrate.

1 8. The process according to claim 7, wherein the step of generating the further
2 plasma includes applying the radio-frequency power to the further gas, the radio-
3 frequency power being not removed between the heating up of the substrate and the
4 deposition of the layer of Silicon Nitride.

1 9. The process according to claim 7, further including the step of cooling a
2 surface of the substrate that is not exposed to the further plasma during the heating
3 up of the substrate.

1 10. The process according to claim 1, further including the steps after the
2 deposition of the layer of Silicon Nitride of:
3 providing a still further gas including Oxygen,
4 generating a still further plasma from the still further gas to de-chuck the
5 substrate from an electrostatic chuck, thereby generating a second oxide liner on the
6 layer of Silicon Nitride.